General Notes.

MINERALOGY AND CRYSTALLOGRAPHY.[1]

The Chemical Composition of Turquoises.—Carnot[2] notes the occurrence of turquoise in the Burrow Mts., Grant Co., N. M., in a sort of pinkish-gray pegmatite. The structure is micro-crystalline, the fracture irregular and somewhat conchoidal. The analysis given is: P_2O_5 28.29, Al_2O_3 34.32, CuO 7.41, FeO .91, MnO trace, CaO 7.93, MgO trace, H_2O 18.24, F trace, quartz or clay 2.73, total 99.83. An analysis of the well known Persian turquoise gave P_2O_5 29.43, Al_2O_3 42.17, CuO 5.10, FeO 4.50, H_2O 18.59, quartz or clay .21, total, 100.00.

These analyses and others already published show, it is true, a good deal of variation in the composition of turquoise, yet are thought by Carnot to agree fairly with the formula P_2O_5 (Al_2 Cu_3 Fe_3 Ca_3) O_3+ Al_2O_3+5 H_2O. Stress is laid on the determination of *all* the iron as ferrous. The above data were obtained from the true oriental turquoise, or that "of the old rock."

The occidental turquoise, or that "of the new rock" may better be called odontolite, coming from the teeth of fossil mammals. They are very variable in composition, and contain iron in the ferric condition, as well as 3.02 per cent, or, in another specimen, 3.45 per cent of fluorine, thus differing from the oriental turquoise.

The occidental turquoise may be distinguished from ordinary bones and fossils by lack of calcium carbonate, presence of ferric phosphate, and by the large quantity of aluminium phosphate, also by the blue color.

Alstonite and Barytocalcite.—A posthumous note by Mallard[3] presented to the French Society of Mineralogy by M. Termier, gives interesting comparisons between the properties of the minerals containing barium and calcium carbonates. While barytocalcite has been long considered to be a double salt, the usual view concerning alstonite has been that it is an isomorphous mixture of the two carbonates. A series of analyses made by Chatelier suggests that alstonite may be also a double salt with the same formula as barytocalcite. The prismatic

[1] Edited by A. C. Gill, Cornell University, Ithaca, N. Y.

[2] Bull. Soc. Fr. Min., XVIII, pp. 119-123, 1895.

[3] Bull. Soc. Fr. Min., XVIII, pp. 7–12, 1895.

angle of alstonite is determined as 119° 9′, which is not in accord with the view that it is an isomorphous mixture of witherite and aragonite, since their corresponding angles are 117° 48′ and 116° 16′ respectively.

The indices of refraction of witherite, alstonite and barytocalcite for sodium light were measured and compared with those af aragonite and calcite. In the following table, column III gives the mean between the values for aragonite and for witherite:

	I Aragonite	II Witherite	III Mean	IV Alstonite	V Barytocalcite	VI Calcite
α	1.5301	1.529	1.5295	1.525	1.525	1.48625
β	1.6816	1.676	1.679	1.673 (?)	1.684	
γ	1.6859	1.677	1.681		1.686	1.6585
Sp. G.	2.94	4.28	3.61	3.71	3.65	2.73

Attention is called to the remarkable crystallographic similarity between barytocalcite and calcite, nothwithstanding the difference in crystal system. The cleavage of barytocalcite form a pseudorhombohedron, being basal and prismatic. The angle of the prism 106° 54′, and the angle between the base and prism is 102° 54′, while the cleavage rhombohedron of calcite has angle of 105° 5′. Moreover, the optical angle of barytocalcite is small, and the negative acute bisectrix make an angle of +64° 22′ with the c axis (i. e., with the intersection of the prismatic cleavages); the optical angle of calcite is zero, and the negative optical axis makes an angle of +63° 44′ with the intersection of two rhombohedral cleavages.

In conclusion Buchrucker's values for the indices of strontianite are corrected. Mallard's values for Na light are: $\alpha = 1.518$, $\beta = 1.664$, $\gamma = 1.665$.

Rutile, Cassiterite and Zircon.—According to Traube,[4] who discusses the question of the isomorphism of the above minerals, the etched figures produced by KF or KF HF are exactly similar for each of the three species, and indicate holohedral symmetry in the tetragonal system.

An attempt to make rutile containing SiO_2 was not successful, though Traube considers that it must have been so in case rutile and zircon were isomorphous. Synthetic experiments were also made for the purpose of throwing light on the mode of occurrence of Fe_2O_3 in these minerals. By heating chemically pure amorphous titanium dioxide in a platinum crucible with sodium tungstate and a metallic oxide, the following results were obtained. With Fe_2O_3 rutile was formed containing in one case as much as 5.4 per cent of that oxide; rutile

[4] Neues Jahrb. B.B. X, pp. 470–476, 1896.

with 3.01 per cent Mn_2O_3, and in another case with 1.91 per cent Cr_2O_3 was prepared, but similar experiments with the oxides of nickel and cobalt were not successful, the rutile crystals containing no appreciable trace of Ni or Co. Chromiferous crystals of cassiterite were also formed. It seems, therefore, that these substances have a peculiar affinity for the oxides of the type R_2O_3, but not for those of the form RO.

Colored specimens of all three minerals become permanently lighter in color on heating.

Marignac's process for fusing zircon (i.e., with KF or with KF HF) was tried with rutile and cassiterite. Like zircon they both fuse rather readily, forming $K_2 TiF_6$ and $K_2 SnF_6$ respectively.

Miscellaneous Notes.—Wülfing[5] describes a simple apparatus for obtaining monochromatic light from direct sunlight. The experiments on quartz seem to show that the apparatus works with a good degree of accuracy. Measurements of the index of refraction of diamond gave for A, n=2.4024; for D, n=2.4175; and for H, n=2.4652. These are three of several values determined. The specific gravity of these diamonds referred to water at 4° was found to be 2.522±.003. Hematite from Elba was also investigated, giving:

ω	ε	
2.904	2.690	for line A
2.988	2.755	for line B
3.042	2.797	for line C

The specific gravity at 4° is 5.285±.002. A description is also given of a spectrum apparatus for use with a microscope or an axial angle instrument. In a later note[6] Wülfing gives a table comparing the values of the indices of refraction of the diamond obtained by himself with those determined by Walter; the agreement is very close. He states that either apparatus above mentioned may be obtained of Eug. Albrecht in Tübingen.

Kretschmer[7] describes the occurrence of garnet, vesuvianite, wollastonite, epidote, augite, quartz and calcite at the contact of marble with granite near Friedeberg in Silesia. Minute details as to locality, association and crystal form are recorded.

Goguel[8] reports on the crystal form, and in some cases on the optical behavior of formopyrine, $C_{12} H_{14} N_2O_2$, and its addition salts with

[5] Tscherm. Mitth., XV, pp. 47–76, 1895.

[6] Ibid, p. 350.

[7] Tscherm. Mitth., XV, pp. 9–28, 1895.

[8] Bull. Soc. Fr. Min., XVIII, pp. 27–31, 1895.

hydrochloric, sulphuric, nitric, phosphoric and oxalic acids.—Duparc and Pearce[9] have measured the crystal angles and observed the optical properties of eight new chemical compounds. These are benzoyl-malic acid, sodium orthophenyl-benzoate, potassium orthophenyl-benzoate, ammonium phenyl-glycolate, dextrocinchonine phenyl-glycolate, benzylic ether of bromo-tolu-quinone oxime, potassium luteo-phosphomolybdate and a potassium luteo-phosphotungstate.

Of late numerous additions have been made to our knowledge of the crystallographic and optical constants of organic compounds. The following three papers in Volume XXV in the Zeitschrift für Krystallographie may be cited as important contributions to this line. 1. The Crystal form of Some New Halogen Derivatives of Camphor, by F. S. Kipping and W. J. Pope; 2. On the Crystal Form of Some Organic Compounds, by W. J. Pope; 3. Crystallographic and Optical Investigations on Some Organic Compounds, by E. A. Wülfing.

An artificial cassiterite investigated by Arzruni[10] shows distinct dichroism with the ray vibrating parallel to the vertical axis colorless, while the ray vibrating at right angles thereto is pink. The crystals reach a half centimeter in thickness and twice that in length. Twins, which are so common with natural cassiterite, were not observed. The angles measured coincide within 2′ with those given by Becke for the natural mineral. The mean values from two determinations of the indices of refraction are:

	Li	Na	Tl
ω	1.9846	1.9968	2.0093
ε	2.0817	2.0929	2.1053

These numbers agree as well as could be expected with those obtained by Grubenmann for cassiterite, showing that the natural and artificial products are practically identical.

Schmidt[11] gives at great length tables showing the recurrence of like interfacial angles in the regular system. As an extreme example, the angle 35° 15′ 52″ occurs between eleven pairs of faces, the cube, octahedron or dodecahedron constituting one face of each pair. The table at the end of the paper may be of use for rapidly identifying rare faces on regular crystals.

Sohncke[12] shows that in accordance with his views of crystal structure no circular polarization is to be expected in crystals of the pyramidal

[9] Bull. Soc. Fr. Min., XVIII, pp. 31--43, 1895.
[10] Zeitschr. f. Kryst., XXV, pp. 467--470, 1895.
[11] Zeitschr. f. Kryst., XXV, pp. 477--503, 1895.
[12] Zeitschr. f. Kryst., XXV, p. 529, 1895.

tetragonal class (hemimorphic hemihedral division of the tetragonal system). So far as known, circular polarization is not exhibited by crystals with this grade of symmetry.

PETROGRAPHY.[1]

Petrography of the Bearpaw Mountains, Montana.—The Bearpaw Mountains are the dissected remains of a group of Tertiary volcanoes. Their cores of the old volcanoes are granular rocks, their lavas and tuffs are represented by basic sheets and beds. The lavas are largely basalts, leucite-basalt and other similar basic types.[2]

The cores consist of mica-trachytes, quartz-syenite, porphyries, containing aegerite-augite and anothoclase-phenocrysts, in which are imbedded microlites of oligoclase, trachytes containing hornblende and diopside and shonkinite. A few miles from Bearpaw Peak a denuded core is exposed, which furnishes a good example of the differentiation of a syenite in place. The intrusion is laccolitic in character. Around its borders it has highly altered the sedimentary rocks with which it is in contact. The most acid portion of the laccolite is a light aplitic syenite containing quartz and diopside. The main mass is a more basic syenite resembling monzonite or yogoite. It contains diopside and much plagioclase. The most basic phase is a shonkinite. Analyses for the three principal types follow:

	SiO_2	Al_2O_3	Fe_2O_3	FeO	MgO	CaO	Na_2O	K_2O	H_2O_5	Other	Total
Quartz-syenite	68.34	15.32	1.90	.84	.54	.92	5.45	5.62	.45	.57	= 99.95
Monzonite	52.81	15.66	3.06	4.76	4.99	7.57	3.60	4.84	1.09	1.86	=100.24
Shonkinite	50.00	9.87	3.46	5.01	11.92	8.31	2.41	5.02	1.33	2.68	=100.01

The totals corrected for Fe and Ce are 99.94, 100.22 and 99.93 respectively.

Two French Rocks.—In the serpentine of St. Préjet-Armadon, Haute-Loire, France, Lacrou[3] finds nodules composed of asbestiform gedrite surrounding a kernel of serpentine or biotite. The nodules are separated from the serpentine by an envelope of biotite. They are sup-

[1] Edited by Dr. W. S. Bayley, Colby University, Waterville, Me.

[2] Weed and Pirson: Amer. Journ. Sci., IV, Vol. 1, p. 283 and 351.

[3] Bull. Soc. Franc. d. Min., XIX, p. 687.